

**EFCOG ESH Working Group
Industrial Hygiene/Industrial Safety Subgroup**

**BNL Approach to
IH Baseline Monitoring**

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History

- FY05 BHSO Audited BNL's IH program
 - Findings included
 - Lack of baseline monitoring; chemical and physical
 - Good qualification of IH staff (SMEs) but poor qualification and lack of direction for of allied support personnel

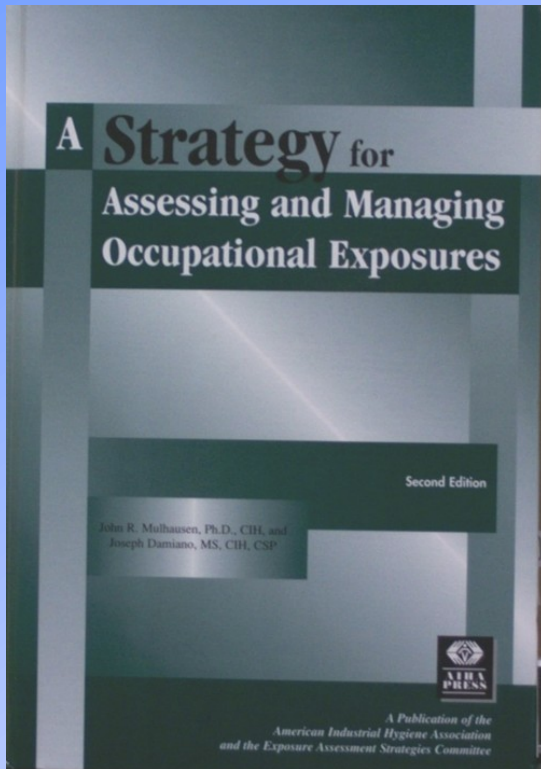
- FY05-06 BNL develops and implements Corrective Actions
 - Deploy SMEs to field locations
 - Institutes Worker Safety and Health Annual IH Monitoring Plan: sets monitoring priorities
 - Identifies resource needs for IH Baseline
 - Identifies value of contractor services
 - independent third party
 - expert in the field;
 - Nationally recognized and experienced in small laboratory settings

- FY07 BNL Identifies IH Baseline Gap
 - IH Monitoring Gap transferred to NTS of 851
 - April-September Contractor conducts chemical monitoring for small science organizations
 - 10 CFR 851 effective
 - Requires IH baseline monitoring; no definition

- FY08 Continue IH Baseline Monitoring using internal resources and contractor services
 - Contractor has identified specific monitoring needs and provided general hazard assessment for chemical operations of small quantities, low volatility chemicals when used in engineering control (hood or enclosed system)

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Fundamental Guidance Documents



AIHA: *A Strategy for
Assessing and Managing
Occupational Exposures*

NIOSH: *Occupational
Exposure Sampling Strategy
Manual*

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Project Progression

- **IH Hazard Matrix**
- **IH Calculator: development of resource needs**
 - S&H representative meets with each ESHC
 - Review all ESRs
 - Review/estimate of all ongoing routine work
 - * • Initial determination of monitoring events (not total samples)
 - Determine resource allocation by name and estimate hours per event for all associated tasks (sampling prep, monitoring, data entry, analytical report review, evaluation, report prep)
 - Spreadsheets by department
 - **Sample analysis cost is not part of the resource needs for BNL**
- **IH Scheduler: development of specific monitoring tasks**
 - Determination and future refinement of rank based on previous and current monitoring
 - Determine date of next monitoring event by revised Rank

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Step 1

Identify Initial Hazard Categories

- Welding/Cutting/Brazing
- Noise
- Beryllium
- Cadmium
- Chemicals (later refined to include lead, cadmium, beryllium, reproductive hazards)
- Lead
- Silica
- Asbestos
- Reproductive Hazards
- Radiofrequency (RF/MW)
- Static Magnetic Fields
- Heat Stress
- Confined Space (removed in future as not part of baseline)
- Reproductive Hazards
- Lasers (removed in future as not part of baseline)
- Ergonomics (removed in future as not part of baseline)
- Biohazards (removed in future as not part of baseline)

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Worker Safety and Health Annual Industrial Hygiene Monitoring Plan FY 2006

Step 3

Develop the **IH Calculator** to assess the effort required for regulatory compliance.

Using the number of monitoring events and average estimates of time for each event, the **resource need is generated for each department**. This encompasses a full characterization estimate.

Estimate for BNL: 5 people for 11 years to conduct full characterization.

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	FY:	2006															
2	Organization:	EENS															
3																	
4		Hazard	Action			of Actions	Hrs/ Action	Total Hours	FTE	FTE	Supplier of Service						Priority to Org
5											SHR	RCD	ECR	Line org	Gap		
6	Specific Hazard Assessments																
7	Welding/Cutting/Brazing		(IH75)														
8		Source Inventory			0	10	0	0.000									
9		Area Characterizations															
10		Air Sampling			0	8	0	0.000									
11		Surface Sampling			0	2	0	0.000									
12		Exposed Worker Inventory			0	10	0	0.000									
13		Worker Exposure Measurements			0	8	0	0.000		0.00							
14	Noise		(IH36)														
15		Source Inventory			1	20	20	0.013									
16		Area Survey			15	8	120	0.080									
17		Exposed Worker Inventory			1	20	20	0.013									
18		Worker Dosimetry			20	8	160	0.107		0.21							
19	Berghium		(IH06)														
20		Source Inventory			0	10	0	0.000									
21		Area Characterizations															
22		Air Sampling			0	8	0	0.000									
23		Surface Sampling			0	2	0	0.000									
24		Exposed Worker Inventory			0	10	0	0.000									
25		Worker Exposure Measurements			0	8	0	0.000		0.00							
26	Cadmium		(IH75)														
27		Source Inventory			1	10	10	0.007									
28		Area Characterizations															
29		Air Sampling			0	8	0	0.000									
30		Surface Sampling			10	2	20	0.013									
31		Exposed Worker Inventory			1	10	10	0.007									
32		Worker Exposure Measurements			4	8	32	0.021		0.05							
33	Chemicals: Carcinogens and chemicals of potential for exposure above Occupational Exposure Limits (IH75)																
34		Source Inventory			1	20	20	0.013									
35		Area Characterizations															
36		Air Sampling			30	8	240	0.160									
37		Surface Sampling			35	3	105	0.070									
38		Exposed Worker Inventory			1	10	10	0.007									
39		Worker Exposure Measurements			20	8	160	0.107		0.36							
40	Lead		(IH03)														
41		Source Inventory			1	20	20	0.013									
42		Area Characterizations															
43		Air Sampling			6	8	48	0.032									
44		Surface Sampling			24	2	48	0.032									
45		Exposed Worker Inventory			1	20	20	0.013									
46		Worker Exposure Measurements			3	8	24	0.016		0.11							
47		Total FTE Needs								1.37							

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Worker Safety and Health Annual Industrial Hygiene Monitoring Plan FY 2007

4. Exposure Characterization, Hazard Ranking and Sampling Frequency

The ***IH Scheduler*** is a tool that ranks the monitoring events and establishes the frequency for future sampling (routine monitoring) events based on the rank profile.

“Ideal strategy for defining the exposure profile ...monitor each worker’s exposure each day. ...generally not possible, a subset of workers and days ... is chosen...results are used to estimate the exposure profile inferentially. ... If the exposure profile is highly variable or positioned within the range of 10% to 100% of the OEL, then more samples might be needed to adequately characterize the exposure profile.”

AIHA: *A Strategy for Assessing and Managing Occupational Exposures, Second Edition*

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Ranking Exposure Monitoring Data

Risk Category	Exposure Level	Relative Risk	Frequency of Monitoring
A	Worker exposure exceeds OEL on TWA ₈	Significant risk	All workers in SEG during each job until PPE requirements characterized, then all workers quarterly
B	Area exposure level exceeds OEL but worker exposure is <TWA ₈ based on duration in area	May be at significant risk. Needs further evaluation: compliance with OEL uncertain	25% of workers in SEG, quarterly
C	Area/worker exposure is >10% of OEL to OEL level	Moderate risk	10% of workers once per year
D	Area/worker exposure <10% of OEL.	Low risk	1 representative sample per year for three years, then one sample per 3 year cycle
U	Unknown area/personal exposure	Risk assigned on best available guidance	Sample on next operation(s) until characterized as A-D

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IH Scheduler

- Identifies specific tasks to monitor

- Assesses risk rank by monitoring results (or best professional judgement)

- Provides sample date information

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
	Building	Location	Source Title	Hazard	Sample Type	Exposure Ranking	Last Sample date	Next Sample Date	Name-IH Pro	Time-IH Pro Setup	Name-Sampler	Time (hrs)	Time - IH Pro Report	IH Project #	Comment
1	815	Lab C-8	Experiment	Organic solvent	Area Survey Event	C			L. Stiegler	2	L. Stiegler	16	4		multiple sample events
2	815	Lab E-6	Experiment	Organic solvent	Area Survey Event	C	13-Aug-07		L. Stiegler	2	L. Stiegler	16	4		CS #476
3	815	Lab E-5	Experiment	Organic solvent	Area Survey Event	C			L. Stiegler	2	L. Stiegler	16	4		multiple sample events
4	490D	5-136	Belt Sander	Noise	Area survey event	B	25-Jul-05		L. Stiegler	2	L. Stiegler	8	2	0	
5	815	Lab C-5	Experiment	Organic solvent	Personnel sampling event	C			L. Stiegler	2	L. Stiegler	16	4		multiple sample events
6	815	Exterior	A/C unit	Noise	Personnel sampling event	C	26-Apr-05		L. Stiegler	2	L. Stiegler	8	4		multiple sample events
7	490A	Lab 12-107	Experiment	Carcinogen	Area Survey Event	C			L. Stiegler	2	L. Stiegler	16	4		multiple sample events
8	815	Lab C-3	Hoods	Noise	Area Survey Event	C	27-Jul-05	7/2007	L. Stiegler	2	L. Stiegler	8	4		multiple sample events
9	815	Lab C-6	Hoods	Noise	Area Survey Event	C	27-Jul-05	7/2007	L. Stiegler	2	L. Stiegler	8	4		multiple sample events
10	815	Lab E-5	Hoods	Noise	Area Survey Event	C	13-Sep-05	7/2007	L. Stiegler	2	L. Stiegler	8	4		multiple sample events
11	815	Exterior Courtyard	Exterior A/C unit	Noise	Area Survey Event	C	13-Sep-05	7/2007	L. Stiegler	2	L. Stiegler	8	4		multiple sample events
12	526	Office	Exterior A/C unit	Noise	Personnel sampling event	D	02-May-05	6/2007	L. Stiegler	2	L. Stiegler	16	4		multiple sample events
13	830	Lab 4	Experiment - SPSS	Chemical-mercury	Personnel sampling event	D	07-Feb-06	2/2007	L. Stiegler	2	L. Stiegler	8	4	60095	Small pot experiment completed
14															

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**BNL IH Group: ATS funding application for reduced IH
Baseline ~ 500k for 2 years. This would cover all operations
once with exposure rank guestimating >10% of OEL.**

Actual funding

\$ 200 K FY 2007

\$ 300 K FY 2008

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IH Baseline Monitoring Contractor Services

■ Scope Of Work

- Primary contractor - nationally recognized expert with extensive experience in research lab environment - IH monitoring and hazard assessment.
- Full time onsite CIH oversight
- Complete training and conduct all monitoring in adherence to BNL sampling protocols. This includes data entry to our IH monitoring database – Compliance Suite
- BNL provides all computer equipment, monitoring equipment and analytical services.
- Contractor interacts directly with departments to establish monitoring schedules, prepares equipment, including calibration, follows BNL documentation procedures, prepares employee notification of monitoring results and individual project reports.
- Primary for contractor reviews all ESRs provided to determine need for IH monitoring. Expected to be ~ 200 ESRs.

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IH Baseline Monitoring Contractor Services

Contract Performance

- **FY07 May-September**
 - Reviewed ~140 ESRs and provided priority of sampling needs (our marching orders for FY08)
 - 59 monitoring events completed
 - Primarily small quantities of chemicals in small science labs manipulated in hoods
 - Area/Personal Noise monitoring for plant engineering
 - Area surveys for mercury in old labs
 - Surface wipe sampling around balances and soldering stations

- **Barriers to additional performance**
 - Difficulty in 'catching' work in progress;
 - Not opportune time of year; grant proposal writing, vacations, etc.
 - Compressed contract duration due to:
 - late funds availability,
 - desire by management to explore all options for coverage by internal employees.
 - Necessity to complete all invoicing by end of fiscal year – required early termination for analytical results and invoicing

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IH Monitoring Contractor Final Report

“Without exception, exposures did not approach ACGIH, BNL and /or OSHA exposure limits for chemical tasks performed within functioning chemical fume hoods.”

“Sampling priority would likely be low for compounds with vapor pressure up to 200-mm mercury and quantities up to 6-liters when used in a chemical fume hood or a closed system.”

“An exception could include a material with a very low exposure limit, i.e., 1-ppm or less, and reasonably high vapor pressure, i.e., 100-mm of mercury, when handled in quantities greater than 100-mls.”

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BNL Worker Safety and Health Annual Industrial Hygiene Monitoring Plan FY 2008

- The primary goals for FY08 are:
 - Continued implementation of the IH Scheduler for routine monitoring
 - Completion of the IH baseline monitoring program by September 30, 2008. This will be accomplished through an extension of the IH Baseline Monitoring consultant contract.

Completion of the IH Baseline monitoring is determined as conducting a single monitoring event on all operations at BNL.

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BNL Worker Safety and Health Annual Industrial Hygiene Monitoring Plan FY 2008

”In addition, during the first quarter of FY08 the reported results and hazard analyses provided by our FY07 IH Baseline Monitoring consultant will be reviewed during the course of FY08.“

“Monitoring requirements recommended by the consultant will be added/updated in the IH Scheduler. Where the consultant has analyzed activities, through the ESR reviews and monitoring reports, and determined a reduced schedule or elimination of monitoring, these items will be altered/removed from the IH Scheduler. “